

Garden Roses

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GARDEN ROSES

E. A. WHITE

ROSES are loved by all classes of people, and should be grown more generally in New York State. The slogan of The American Rose Society, "A Rose for Every Home; a Bush for Every Garden," should be the motto of every home owner.

Many persons consider roses difficult to grow and exacting in their cultural requirements, but if the right varieties are chosen and the plants are given reasonable care, they are no more difficult than are other genera of garden flowers. Roses certainly repay one for the time devoted to them by the profusion of cut flowers from early spring to fall, and the free-flowering Polyanthas in particular make a blaze of color in the garden throughout the summer. It is hoped that this discussion of the rose and its culture, with the directions for disease and insect control, may be an inspiration to all persons in the suburban and rural sections of New York State to grow more roses.

The aim of this bulletin has been to recommend those varieties that have proved hardy under climatic conditions in New York State. Many more varieties doubtless will be grown by the experienced rosarian, particularly if he has an experimental instinct. Each year a few new varieties should be added to every rose collection.

ORIGIN AND SPECIES

THE ORIGIN and development of most garden flowers is difficult to trace but the rose is an exception. Its ornamental value has made it a garden favorite throughout the ages. The history of the rose has been so well recorded in literature that space is not given in this bulletin to extensive historical references.

Roses are native in cold and temperate regions of the Northern Hemisphere, and within these limits they occur entirely around the world. Comparatively few native species are used in ornamental planting, and the majority of garden roses are products of the plant-breeders skill. Roses hybridize with ease, and in many instances the blended product of two or more possesses qualities superior to either parent.

¹ AUTHOR'S ACKNOWLEDGMENT. J. Horace McFarland of Harrisburg, Pennsylvania, Editor of *The American Rose Annual*, published by The American Rose Society, has made many valuable suggestions and criticisms in the preparation of this manuscript. Dr. McFarland has an intimate acquaintance with rose varieties and his verification of desirable varieties which have proved hardy in the Cornell Test Garden, where the mercury occasionally goes 15 or 20 degrees below zero, makes the lists here given especially valuable.



FIGURE 1. PART OF THE CORNELL TEST GARDEN, INCLUDING HYBRID TEA, HYBRID PERPETUAL, AND POLYANTHA ROSES BORDERED BY PILLAR AND CLIMBING ROSES

Generally, the species used by plant breeders have been of oriental and European origin. It is only recently that an attempt has been made to bring into the "life-stream" of the rose, as sold today, desirable American natives.

By far the larger number of roses grown and sold annually in America are in the Hybrid Tea class. A rose in this class which is generally adaptable to many conditions, is as nearly everblooming as any rose can be, and as now improved carries all the colors, all the forms, from single to very double, and various grades of vigor.

The older Hybrid Perpetuals, which are perpetual only in the sense that the plants are rather permanent, were the most important garden roses, both in Europe and in America, until a combination with the still older Tea Rose strain produced, about seventy-five years ago, the Hybrid Tea class. The Hybrid Perpetuals bloom abundantly in one grand display in early summer, and, under proper conditions of pruning, care, and general nurture, may bloom again. They should be called *remontant*, which means *to bloom again*. These roses are commended as the dependable roses which tend to become old-fashioned. Many of the old roses found in gardens are true Hybrid Perpetuals.

A great improvement in the color, form, and fragrance of the Hybrid Tea rose followed the introduction by Pernet-Ducher, of Lyons, France, of a variety resulting from a cross between the Austrian Brier (*Rosa lutea*, or *R. foetida*) and a Hybrid Perpetual rose. With this start, the great Frenchman, a persistent and famous hybridizer, bought the same "blood" into the Hybrid Tea strain, introducing thereby what he called the *Pernetiana group*, characterized by either clear yellow or orange-tinted flowers, but otherwise broadly similar to the Hybrid Teas. The *Pernetiana* group has not been recognized by the American Rose Society as distinct enough to be listed separately, because, through the inter-breeding which is characteristic of the rose family, many of the original characters have been lost, though the brilliancy of color which was the reason for the first cross has been carried along and in some cases has even been increased.

Hardy Climbing Roses are of very great importance, and have vastly improved in vigor, color, quality, and general scope since they were bred upon the base, first, of *Rosa multiflora*, the Blackberry Rose, and later upon the Japanese *R. wichuraiana*. Both of these oriental species have been bred into Teas, Hybrid Teas, and the like, and have been so interbred that it is virtually impossible to distinguish them. A separate classification of the Hardy Climbers of *multiflora* origin or of *wichuraiana* origin is not warranted.

Incidentally, it should be noted that from a form of *Rosa multiflora* there has been developed a constant-blooming, quite hardy, and very desirable group now known as *Polyanthas*, or miscalled *baby ramblers*. These in two forms, one with characteristic *multiflora* flowers and the other with much larger flowers, are now available in an excellent range of colors and forms.

The Rugosa rose of Japan, itself a dependable hardy shrub of great luxuriance and particularly adaptable for hedges, has been combined with many of the Hybrid Teas and Hybrid Perpetuals. The resulting Rugosa hybrids, while not always hardy under all conditions, are classed among the roses suitable for backgrounds, as they grow to 8 feet and more in height. Many of them tend to bloom repeatedly during the season.

One of the most desirable qualities of the climbing rose is hardiness. The Prairie Rose, *R. setigera*, has recently been bred into certain crosses with great success. In nature it is a late-blooming, single-flowered pink rose, growing to a height of from 6 to 10 feet. The new hybrids have given remarkable double-flowered shrubs of vigor and hardiness.



FIGURE 2. WHITE DOROTHY, A HYBRID MULTIFLORA

The natural, or species, roses are shrubs of real importance. They should be considered independently of the rose garden, and used in the shrubbery, in the borders, for protection, and the like. The desirable species that are now generally available are:

<i>alba</i> , Yard	<i>moyesi</i> , Moyes'
<i>bella</i> , Solitary	<i>omiensis</i> , Mt. Omei
<i>canina</i> , Dog	<i>pomifera</i> , Apple
<i>centifolia</i> , Cabbage	<i>rubiginosa</i> , Sweetbrier
<i>cinnamomea</i> , Cinnamon	<i>rubrifolia</i> , Redleaf
<i>damascena</i> , Damask	<i>rugosa</i> , Japanese
<i>ecae</i> , Mrs. Aitchinson's	<i>setigera</i> , Prairie
<i>gallica</i> , French	<i>spinosissima</i> , Scotch
<i>lutea</i> , Austrian Brier	<i>wichuraiana</i> , Memorial
<i>hugonis</i> , Father Hugo's	<i>willmottiae</i> , Miss Willmott's
<i>lucida</i> , Virginia	<i>xanthina</i> , Korean



FIGURE 3. PRAIRIE ROSE, ROSA SETIGERA

WHAT ROSES TO PLANT

IN GENERAL, it may be said that species roses and the *rugosas* and their hybrids form admirable backgrounds and are useful in defensive and decorative plantings where their permanence, vigor, and beauty in season make them desirable.

The separate rose garden as usually maintained can have an enclosing border either of the species roses, shrub roses, or climbing roses. Any of these may be treated either as pillars or may be placed over a suitable support to form an enclosing hedge or border.

Inside the garden, or wherever low-growing roses are to be segregated, three classes of roses are recommended: Hybrid Teas, Hybrid Perpetuals, and Polyanthas.

The Tea roses of generations ago are free bloomers, but unfortunately they are not definitely hardy in northern sections of the United States. They offer no advantages over the much hardier and more amenable Hybrid Tea roses.

The rose is a good mixer, and the geneticist is in much difficulty in determining rose origin. Not always have the breeders been mentioned in the records. One exception, however, is that of the Richmond rose, the parentage of which was given the author by the eminent American rose breeder, the late E. G. Hill, of Richmond, Indiana. This pedigree contains so much valuable information on the origin of Hybrid Tea roses, and particularly on the development of red varieties, that it is here included (page 9).

DOUBLE HYBRID TEAS

The substantial basis of the modern rose garden is the Hybrid Tea rose, the origin of which has already been mentioned. The class was originated in 1867 by Guillot, of Lyons, France, who, seeking an extension of the Hybrid Perpetual qualities, bred the Tea rose Mme. Bravy with the Hybrid Perpetual Mme. Victor Verdier. The result was La France, not then recognized as the beginning of a new type which now dominates the rose world. Just about the same time, George Paul, of Cheshunt, England, produced a similar rose, which he called *Cheshunt Hybrid*, and which, although it is now extinct, shares with La France the honor of originating this most important class.

These Hybrid Tea roses have multiplied in number so that each year the American Rose Society reports the introduction of more than a hundred new varieties from various parts of the world, mostly from England, France, Germany, and Spain. With the introduction of the light color through the work of Pernet-Ducher, brilliance was added, and varieties

PEDIGREE OF THE RICHMOND ROSE

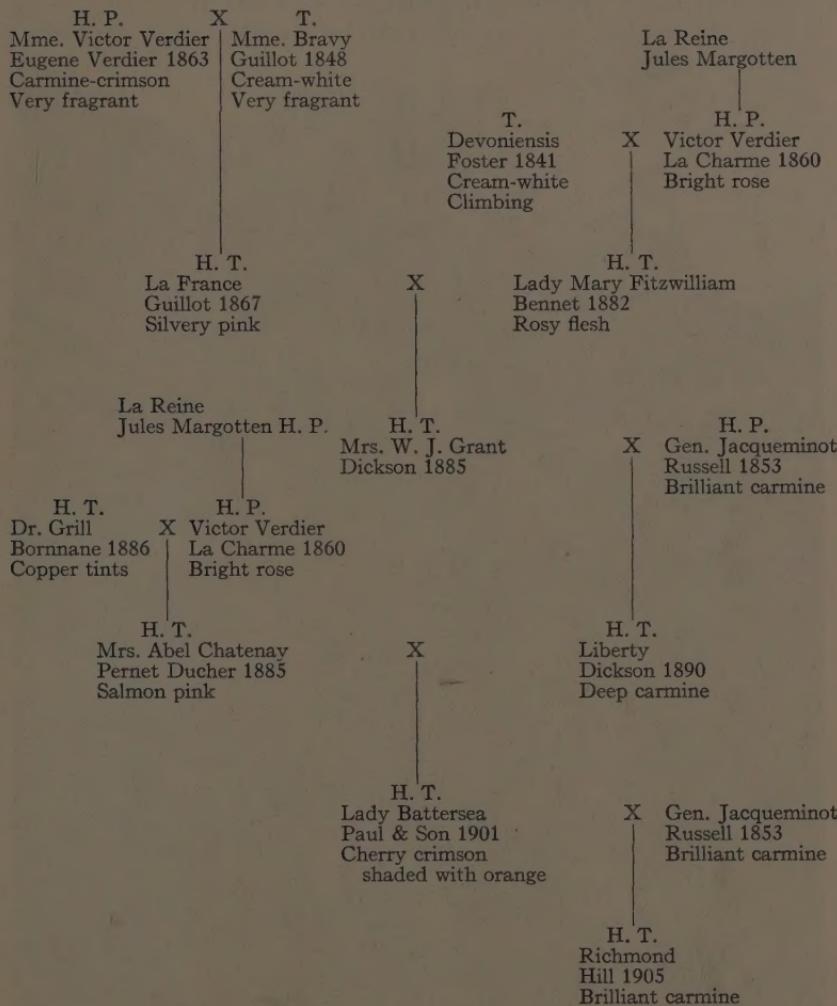




FIGURE 4. AMERICAN PILLAR, A SINGLE-FLOWERED PILLAR

in the Hybrid Tea rose now present every color from pure white to the deepest purple-red, through all shades of scarlet and crimson, as well as yellow, orange, and related tones.

The Hybrid Tea roses are called *everblooming* because they bloom on new growth each year, and, if kept growing, tend to bloom again and again throughout the summer following their great June burst of bloom. In order to keep them in continuous bloom, Hybrid Tea roses require care and attention. The diseases that bother them must be controlled, and as they gain in age and strength they must be adequately fed and well cultivated.

Some of these Hybrid Tea roses show a tendency to taller growth, and there has arisen a class of Climbing Hybrid Tea roses. These form attractive pillars, ranging up to 7 or 8 feet in height. Since the vigor which in the bush form is given to blooming is in the climbing form given mostly to growth, a Climbing Hybrid Tea rose cannot be expected to bloom so freely after its first showing as it does later.

The earlier Hybrid Teas differ considerably from those of recent origin. The varieties which have sometimes been called *Pernetiana* have thicker and more glossy foliage and tend to have more abundant thorns than the earlier Hybrid Teas. They also have a tendency to defoliate in the latter part of the summer unless they are kept growing and protected against disease. Breeders are constantly endeavoring to secure the orange and yellow color advantages of this *Pernetiana* strain without carrying along its tendency to disease.

Hybrid Teas are the principal type used by florists for the winter production of cut flowers, and in America more than 100,000,000 cut roses are marketed each year.

The following varieties of Hybrid Teas believed to be satisfactory and suitable for general use are here listed. It should be realized, however, that the behavior of rose varieties differs with location; so much so that sometimes a rose will succeed in one garden and be less successful in one across the street. All of the following selections are submitted on the basis that the planter will gradually select the varieties found best adapted to his needs.

The newer varieties of recent introduction believed to be worthy of cultivation are also included. As previously mentioned, and following the suggestion of The American Rose Society, no separate classification for Hybrid Tea roses as *Pernetianas* is followed:

White

- Caledonia
- Kaiserin Auguste Viktoria
- Mme. Jules Bouche
- Nuntius Facelli



FIGURE 5. SEPTEMBER BLOOMS FROM GARDEN-GROWN HYBRID TEAS

Pink

Editor McFarland	Mme. Butterfly
Jonkheer J. L. Mock	Mrs. Charles Bell
Kardinal Piff	Mrs. Henry Bowles
Lady Alice Stanley	Mrs. Henry Morse
Lady Ashtown	Radiance
Lady Ursula	Souv. de Mme. C. Chambard
Leonard Barron	Warrawee
Miss Rowena Thom	

Red

Ami Quinard	Gruss an Teplitz
Better Times	Margaret McGredy
Catharine Kordes	Mary Hart
Charles K. Douglas	McGredy's Scarlet
Crimson Glory	National Flower Guild
E. G. Hill	Red Radiance
Etoile de Hollande	Rouge Mallerin
Grenoble	Texas Centennial

Yellow and orange

Amelia Earhart	Mrs. E. P. Thom
Duchess of Wellington	Mrs. Pierre S. duPont
Feu Pernet Ducher	Richard E. West
Golden Dawn	Souvenir
Joanna Hill	Souv. de Jean Soupert
Max Krause	Ville de Paris
Mrs. Aaron Ward	

Bicolors

Alezane; red apricot	
Autumn; burnt orange, yellow, and red	
Betty Uprichard; salmon and coppery pink	
Comtesse Vandal; copper-pink, and gold	
Duquesa de Peñaranda; cinnamon-peach	
Edith Nellie Perkins; orange, salmon, and pink	
Federico Casas; red and yellow	
Heinrich Gaede; orange-copper	
Mme. Cochet Cochet; pink and gold	
Mme. Edouard Herriot; flame	
Mrs. Sam McGredy; orange-salmon	
Padre; coppery scarlet and yellow	
President Herbert Hoover; maroon, orange, and gold	
Talisman; yellow, red, and orange	

SINGLE HYBRID TEAS

The single hybrid tea roses have become very popular during the past few years. The light, airy character of the blooms and the graceful sprays of dainty buds, combined with freedom of bloom, make them especially desirable for cut flowers. They have not, however, the keeping qualities of the double varieties.

The following are desirable:

Dainty Bess; light pink	Isobel; carmine-orange
Innocence; white	Old Gold; orange
Irish Elegance; bronze-pink	Ulster Gem; yellow
Irish Fireflame; orange-crimson	Vesuvius; crimson

HYBRID PERPETUALS, OR REMONTANTS

Next to the Hybrid Tea roses, which are used for the major part of the garden, is the Hybrid Perpetual class. The plants tend to stronger growth than in the Hybrid Tea, and, while they can with pruning be kept as low as 3 feet in height, the average will be from 4 to 5 feet. The size and the beauty of their highly colored flowers, their generally delightful fragrance, their hardiness in most sections without protection, and their taller growth commend them as indispensable in the well-ordered rose garden.

Twelve popular varieties of hybrid perpetuals are:

- American Beauty; dark pink
- Anna de Diesbach; rose-carmine
- Baron de Bonstetten; very dark, velvety maroon
- Baroness Rothschild; light pink
- Clio; pale pink
- Frau Karl Druschki; white—probably the best white rose in cultivation



FIGURE 6. FRAU KARL DRUSCHKI, A HYBRID PERPETUAL

General Jacqueminot; scarlet-crimson
Georg Arends; soft pink
Hugh Dickson; scarlet-crimson
Magna Charta; bright pink
Mrs. John Laing; clear pink
Prince Camille de Rohan; dark crimson



FIGURE 7. MRS. W. H. CUTBUSH, A POLYANTHA

POLYANTHAS

While not so desirable for cut flowers as Hybrid Teas or Hybrid Perpetuals, the abundance and continuity of bloom make Polyanthas excellent for garden effects. They are called *cluster roses*. In New York State the Polyantha roses are continuous in their bloom production from the first of June until frost, and include colors, forms, and characters which make them desirable for most uses where a plant less than 2 feet in height is allowable.

- Anne Mette Poulsen; scarlet-crimson
- Chatillon Rose; pink
- Belvedere; dark red
- Distinction; pink
- Eblouissant; dark red; dwarf
- Ellen Poulsen; pink
- Elsie Poulsen; pink; tall
- Fluffy Ruffles; pink
- Golden Salmon; reddish orange
- Gloria Mundi; scarlet orange
- Gruss an Aachen; shell pink
- Ideal; dark red
- Karen Poulsen; scarlet
- Katharine Zeimet; white
- Kirsten Poulsen; scarlet
- Lafayette; light red
- Mme. Cecile Brunner (Sweetheart Rose); pink
- Miss Edith Cavell; crimson
- Mrs. R. M. Finch; pink
- Permanent Wave; rosy pink
- Rochester; buff and copper
- Sunshine; orange

RUGOSAS

As previously stated, *Rosa rugosa* has been used as a parent for crossing with Hybrid Perpetuals, Hybrid Teas, and other roses. The *rugosas* are best suited for planting in shrub borders or as specimen plants for the lawn. They are strong, robust growers and may crowd out less-vigorous types.

- Agnes; yellow
- Amelia Gravereaux; red; pillar
- Conrad Ferdinand Meyer;
silvery pink; pillar
- Dr. E. M. Mills; soft pink
- Dr. Eckener; pink and gold
- F. J. Grootendorst; red
- Mme. Georges Bruant; white
- New Century; pink; pillar
- Pink Grootendorst; pink
- Roseraie de l'Hay; dark red
- Sarah Van Fleet; pink
- Rugosa rubra; red
- Rugosa alba; white
- Vanguard; orange-salmon



FIGURE 8. F. J. GROOSTENDORST, A HYBRID RUGOSA

CLIMBING, RAMBLING, AND PILLAR ROSES

Mention has already been made of the way in which the large group of excellent roses based on *Rosa multiflora* and *R. wichuraiana* have been intercrossed with the finer forms of the Hybrid Tea and the Hybrid Perpetual classes, and splendid varieties of climbers have been developed. These give a show of great beauty, and are particularly suitable over arches, trellises, and the like, over fences and as hedges or trained upright as pillars.

In New York, Crimson Rambler was first offered to American commerce; the widely prevalent Dorothy Perkins also originated in this State. Dorothy Perkins is still extensively grown but the Crimson Rambler has been superseded by many better varieties more attractive in form or less susceptible to disease. A selection of excellent varieties to be used either for their ordinary climbing habit or to be trained as pillars is the following:

- American Pillar; deep pink, white edge
- Blaze; bright red; remontant
- Climbing American Beauty; light red
- Dr. Huey; maroon
- Dr. W. Van Fleet; flesh
- Doublonns; buff



FIGURE 9. CLIMBING ROSES TRAINED TO WIRES, AND PILLAR ROSES TRAINED TO POSTS

Excelsa; red
Ghislaine de Felegonde; yellow buds, pale buff flowers
Glenn Dale; white
Hiawatha; crimson, white eye
Mary Wallace; pink
Mercedes Gallart; cerise-red; remontant
Mme. Grégoire Staechelin; pink
Mrs. Arthur Curtiss James; yellow
New Dawn; flesh; remontant
Paul's Scarlet Climber; scarlet
Primrose; primrose
Scorcher; vermillion
Violette; violet
White Dorothy; white

MISCELLANEOUS ROSES

As the rose is indigenous to the North and South Temperate Zones of the world, and rose interests extend beyond these limits, it is not surprising that there have arisen many sorts not heretofore classified in the main groups. All of these are interesting to the expert rosarian, and as the casual grower succeeds with the ordinary items he may want to pursue the study of the rose family. This can readily be done by consulting works available in any good library, or by joining the American Rose Society, the headquarters of which are at Harrisburg, Pennsylvania. In connection with this organization a loan library is maintained, and members, in addition to other privileges, have opportunity to borrow, without charge, many rose books otherwise difficult to obtain.

Among these somewhat out-of-the-ordinary roses are the Moss roses, broadly resembling the Hybrid Perpetual group in growth and habit, with the additional delightful advantage that the sepals and calyx are covered with a coarse pubescent growth giving them the moss-like appearance which justifies the name. At one time there were many separated varieties of Moss roses, but few are in commerce today. It should be possible to obtain good plants of the following:

Blanche Moreau; white	Malvina; light pink
Comtesse de Murinais; light pink	Old Moss; rose-pink
Golden Moss; buff	Salet; pink; remontant
Henry Martin; red	

The Sweetbriers include the hedge roses of England classified under *Rosa rubiginosa*. The species itself is most desirable as a shrub, as it has tall growth, pink flowers, and a very fragrant foliage. A number of hybrids are known as the Lord Penzance Sweetbriers, among which are Lady Penzance, copper; Lord Penzance, fawn; Lucy Ashton, white with pink margin; and Rose Bradwardine, rose-pink.

Important in this miscellaneous group are the Bourbon roses, of which Hermosa, a bush rose in a soft pink color, and Zephirine Drouhin, a strong-growing, sweet-scented, deep-pink, thornless climber, are particularly useful. The old Souvenir de la Malmaison, with its large flesh-pink flowers, is desirable but rare.

The Damask roses find friends among those liking the old-fashioned flowers. The only one of present-day importance yet in commerce is the York and Lancaster rose, with its flowers of striped pink and white.

The old French roses include those sometimes persisting in old gardens. There are also the large-flowered Cabbage roses. Not many of these are available in commerce, and the rosarian who admires them is usually forced to obtain cuttings or roots from friends who may have them. Very important when it originated was the Noisette rose, which resulted from a hybridization between the Musk rose and the Chinese rose in about 1810. From this class grew eventually the famed Marechal Niel of the South, and Chromatella, Gold of Ophir, and other roses not hardy in the East but highly esteemed on the Pacific Coast. Some botanists include in the Noisette group the old white-flowered garden favorite, Mme. Plantier, which is now scantily obtainable.

The rose species for shrubbery planting have already been mentioned. Here again one is confronted by their general unavailability in commerce. Among those desirable are the Carolina Rose, *R. palustris*; the Prairie Rose, *R. setigera*; the Redleaf Rose, *R. rubrifolia*; and the Scotch Rose, *R. spinosissima*. The Virginia Rose, in its white form, *R. lucida alba*, is excellent if it can be obtained.

Certain Asiatic forms are in commerce. *Rosa hugonis*, the best of these, is a superb, early-flowering hardy shrub that gives a mass of yellow color in the border. Much the same, but sometimes double, is *R. xanthina*, the Korean Rose. *R. moyesii* is a deep-red, single variety with large flowers and beautiful foliage, but it is not easy to grow and is rare. Of this group, *R. hugonis* is the one best adapted for general home use. The old Harison's Yellow and Perisan Yellow are hardy, somewhat leggy plants with good yellow blooms.

Certain odds and ends of rose classes should be mentioned. The green rose, *viridiflora*, considered interesting by some, forms a flower out of aborted leaves. There is a class of so-called fairy, or *Lawrenceana*, roses derived from the *multiflora* group. One species is an exceedingly dwarf rose of which the parentage is obscure. It is *Rosa rouletti*, authentic specimens of which, blooming the season through, can be covered by a coffee cup. This little rose is generally seen in rock gardens.



FIGURE 10. BUSH ROSES PRUNED IN EARLY SPRING

CULTURE OF GARDEN ROSES SOURCE OF PLANTS

FOR SUCCESS, amateurs should buy two-year-old, field-grown, budded plants from a reputable nursery firm, preferably one which makes a speciality of roses. Dependable nursery firms take pride in the quality of plants they put on the market, and while the plants may be a little more expensive than those which can be purchased elsewhere, the satisfaction of having them strong, vigorous, and healthy offsets the additional cost.

Frequently amateurs request information as to methods of home propagation of roses. This is done best by suckers, layers, or cuttings. The resulting plants are designated as *own-root plants* and are not recommended. Seedlings may be grown, but the resulting plantlets are satisfactory only in a few of the species. Budding and grafting are too technical to be practiced by the average amateur.

Propagation by cuttings without leaves

Many roses are rooted easily by taking cuttings of the ripened wood in late fall after the leaves have fallen. The cuttings are made from the previous season's growth and are cut in lengths of from 5 to 8 inches. They are buried with the lower ends up, in sand or sawdust in a cool cellar or out-of-doors in a well-drained situation below the reach of frost. If the cuttings are covered to a depth of 12 or 18 inches and if the surface of the soil is covered with leaves or coarse litter to prevent freezing, the cuttings will be found well calloused in the spring. Then they are planted out of doors in a soil retentive of moisture or where they may be watered in a dry time. The cuttings are inserted so deeply in the soil that only one or two on the upper buds are above the surface. If many cuttings are grown, they are planted about 10 inches apart in the row to facilitate cultivation. Ramblers, Hybrid Wichuraianas, and Hybrid Perpetuals are propagated by this method. Some persons deplore the waste of wood when bush roses are pruned in the spring, but, if this is anticipated in the fall, the shoots cut off may be utilized for cuttings. If delayed until spring, the cuttings usually fail to grow because they are not calloused.

Propagation by cuttings with leaves

Teas, Hybrid Teas, Bourbons, and Noisettes may be propagated by cuttings taken in summer. If cuttings are made in late June, they will develop a root system sufficiently strong to carry them through the winter. The wood selected for cuttings should be neither too soft nor too hard. It is well to take the cutting from a flowering shoot. A cut is made just above a leaf, three or four nodes below the bud. The portion above the cut is discarded. A second slanting cut is made just below a leaf about three nodes below the first cut. All but the top leaf is removed. The terminal leaflet and one pair of leaflets are removed. The cutting is then inserted in soil nearly to the leaf and bud. The soil is moistened and the cutting is covered with a quart fruit jar to prevent loss of moisture with consequent wilting. When the plant has rooted, the jar may be removed.

Propagation by suckers

Such species of roses as *rugosa*, *spinossissima*, *carolina*, *nitida*, *blanda*, *lucida*, as well as all of the Moss, Damask, and Gallica varieties, may be propagated by suckers, or sprouts, which spring up about the base of the parent plant. These suckers may be removed with a ball of earth, in late fall or early spring and transplanted in the desired location. Harison's Yellow and Persian Yellow, as found in old gardens, are usually on their own roots and can be increased in this manner.

Propagation by layers

Propagation by layers is recommended for the amateur who desires a few plants of some varieties and types of climbing garden roses which cannot be grown successfully from cuttings. *Rosa wichuraiana* produces natural layers when grown as a trailing plant, as it forms roots from the nodes, or joints, of the stem. A long, climbing shoot should be stripped of its leaves for 18 inches or 2 feet, and the stem should be bent down to the ground with the tip of the shoot turned upward. At the point where the shoot touches the ground, and where it is covered with soil, a slit is made in the bark and wood by cutting halfway through the shoot and then lengthwise for 1 or 2 inches. Some authorities advise that the cut be begun just below a bud, which may hasten the formation of roots in some varieties. Usually, however, almost all roses will root if the shoots are covered with moist earth in spring or early summer. The shoot must be held firmly in position—it is best to peg it down—and the earth must be kept moist for root development. When the canes have formed roots, the plants may be severed from the parent.

WHEN TO ORDER

Most nursery firms fill their orders in the sequence in which they are received. This gives a preference for fall orders, as those placed in September for fall delivery may be filled with stock superior to that available for later orders, or orders for spring delivery. Spring shipments may be delayed in transit and bud growth may have developed to such an extent that the plants are considerably weakened.

FALL OR SPRING PLANTING

Preference by some rosarians is for fall planting. If weather conditions are favorable, roses may be planted anytime before the ground is frozen solidly. Late October is a good time, provided soil is mounded up about the plants as soon as they are in the ground. The tops may be covered completely without detriment to the plants. Another good practice is to select a well-drained spot and as soon as the plants are received in the fall to dig a trench sufficiently deep so the plants may be laid in it and completely covered with soil. They are left buried until the ground is in suitable condition for spring planting. Burying the plants in this manner keeps the wood and buds plump and firm until spring when, after the ground is sufficiently dried and severe frosts are over, they are planted in their permanent locations.

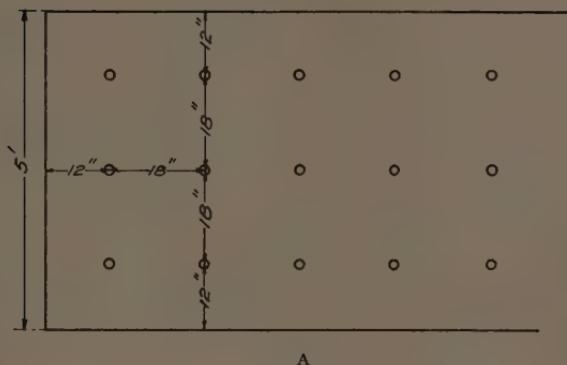
WHERE TO PLANT

The location should be a sunny one and away from trees and shrubs, the roots of which may penetrate the soil and rob the rose plants of needed nutrients. Active air circulation is desirable to discourage mildew. Bush roses may be planted in any open sunny spots in the shrub border. Hybrid Teas, Hybrid Perpetuals, and Polyanthas are planted usually in somewhat formal beds; the climbing and pillar roses are planted more informally either on posts or fences surrounding the rose garden or on arbors. The rose beds should be protected from strong winds but it is not necessary that they should be surrounded by a hedge as is often recommended. If there is a wire fence along the side from which strong winds come frequently, and if this is covered with climbing or pillar types, the protection given the rose bed is ideal. Such a planting also forms an appropriate setting for the rose garden. When the roses are in flower, it becomes a frame for the garden picture. Most roses will do well in partial shade, up to even 40 or 50 per cent.

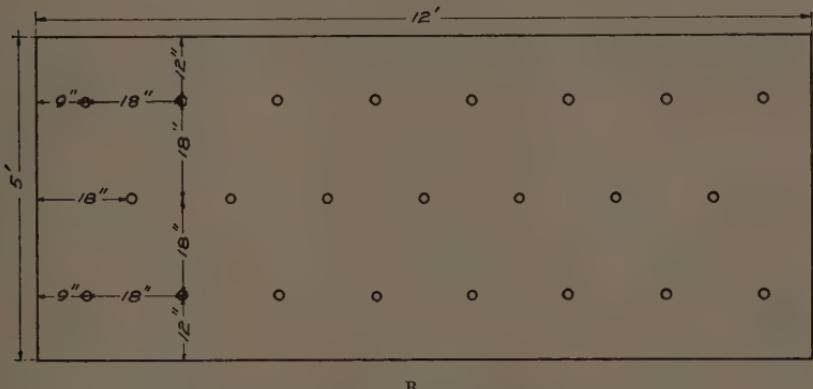
THE GARDEN PLAN

It is chiefly a matter of choice whether rose beds shall be square, rectangular, round, or oval, but a study of the location may assist in the decision. The essential thing is that one should be able to reach every rose plant as often as necessary without stepping on the bed. Compacting the soil frequently is detrimental to the best conditions for growth, therefore the beds should never be more than 5 feet wide, and 4½ feet is preferable. Most Hybrid Teas, and some Hybrid Perpetuals and Polyanthas should be planted 16 to 18 inches apart each way. Some dwarf Polyanthas, such as Mlle. Cecil Brunner and Eblouissant may be planted closer, while the stronger-growing Hybrid Perpetuals, such as Frau Karl Druschki, should be planted 24 by 24 inches apart. The outside rows should be 6 to 12 inches from the edge of the bed. In determining the width of the beds, it is necessary to decide first on the varieties to be planted and also on the number of rows of plants desired. After these two points are settled, the length of the beds is limited only by the requirements of the site or the total number of plants. Except when rose beds are placed along boundaries, it is better not to have the beds too long, thus avoiding the tendency to cross them instead of going around the walks.

Some rose gardens have an elaborate design with beds of various shapes and sizes but, unless one can give his time or can afford a gardener for



A



B

FIGURE 11. PLANTING PLANS OF A ROSE BED

A. This arrangement facilitates cultivation. B. This arrangement utilizes all the space and covers it with leaves and flowers

the proper maintenance of such a scheme, it should not be undertaken. A rose garden with rectangular beds is not difficult to maintain.

The paths in the rose garden preferably should be of grass, and in the North no difficulty is experienced in keeping them in good condition, even in gardens much frequented by visitors.

Ordinarily it is best to plant only roses in the beds. Combinations of rose plants with other species rarely give satisfactory results, for roses grow better if the surface soil is stirred frequently giving a mulch which permits aeration of the soil. However, the Polyantha roses may be satisfactory in a perennial border.

SOIL**Kind**

In early periods it was stated that roses could not be grown successfully unless the soil was of a clay character. Experience has proved that the physical character of the soil is not so important and that roses can be grown in almost any soil that has been properly treated. Cultural treatment of a heavy, clay soil naturally is very different from that of a light, sandy soil. Clay soils should be lightened by the addition of decaying organic matter, and the same treatment renders light soils more retentive of moisture. Good drainage is so essential that before any planting is done either a system of tile drains should be installed or some other provision should be made to take away surplus water at all times. The rose is a water-loving plant and needs large quantities to assure good growth, but it quickly is injured by an excess of standing water in the soil.

Soil tests should show a slight acidity for the best results with roses. The soils which have a pH of 5.5 to 6.5 are suitable. Above this pH value the leaves of the plants may become chlorotic; that is, mottled, with the veins remaining very dark blue-green and the regions between the veins yellow or in severe cases white. Usually the more alkaline the soil the more severe the chlorosis. In order to control chlorosis, it is necessary to know whether it is caused by a too acid condition of the soil or by a too alkaline condition, the so-called lime-induced chlorosis.

If the soil is above pH 6.5, the chlorosis is due to excess lime; and the condition is best corrected by applying iron sulfate up to the rate of 3 pounds per 100 square feet of ground surface, depending upon the degree of alkalinity. After a week or ten days the soil should be tested and, if the pH has not been lowered sufficiently, another application of 1 to 3 pounds per 100 square feet should be made. The treatment should be repeated until the pH is lowered to the desired point. The iron sulfate should be spread evenly over the surface.

If the chlorosis has been caused by too acid a condition of the soil, the pH value will be below pH 5. To correct this, ground limestone is made at the rate of 3 pounds per 100 square feet of ground surface. The application should be repeated until the pH is approximately 5.5. Care must be taken not to apply too much lime or lime-induced chlorosis will result.

Preparation

Thorough preparation of the soil is essential. It is well to prepare it in the beds in the fall and to have them ready for planting early in the spring. The rose is a deep-rooted plant and the roots should strike quickly into the soil so they are not affected by drought. The nature of the sub-

soil is particularly important, and any subsoil poor in character should be discarded. The beds should be 24 inches deep. A six-inch layer of manure is placed in the bottom of the excavation, and then the excavation is filled with a mixture of one part of rotted manure and three parts of turf loam. Some growers place a 6-inch layer of manure in the bottom, then 6 inches of soil, then a layer of manure, and finally fill the beds with soil so they are higher than the level of the walks. This allows for settling, and in the spring the beds are dug over with a fork so as to mix thoroughly the upper layers of soil and manure. Fresh manure may be used if it is placed in the beds in the fall and the planting is deferred until spring. The contact of any heating organic matter with the roots of roses is fatal to the plants. Cow manure may be used fresh, for it does not heat in decomposition.

Planting

Before setting, the plants should be examined carefully. Any bruised or broken roots should be cut off and the longer roots shortened so that they will not have to be twisted or bent in setting. The hole should be large and deep enough so that the roots will extend naturally out and down; this can be accomplished by putting a small mound of soil in the middle of the hole for the plant to be set on. The plant is placed on the mound and the hole is filled with fine, clean soil which is packed tightly among the roots. Shaking the plant lightly will help to fill all crevices. Then the planter tramps the soil as hard as possible with both feet. A bucket of water is poured about the plant and allowed to drain away, then the remaining space is filled with clean soil and is hilled up with the same material to the top of the canes. The soil should not be tramped after this watering. The plant should be set deeply enough so that the bud, or knob where the rose is joined to the understock, is covered not less than 1 nor more than 3 inches deep.

If planted in this manner in the fall, the plant is protected for the winter; and it requires no more care unless there should be dry weather before the ground freezes, in which case the plants should have a good watering. The soil around the roots should always be moist when the ground freezes.

In spring planting, the plants are hilled as described, and the hills are allowed to remain two or three weeks in order to prevent sun and wind from drying out the canes before new feeding-rootlets can be formed to replace this loss of moisture. After three weeks the hills can safely be removed.

Since a year is required for the plant to grow a root system that can keep it supplied with sufficient water, one should see, for the first year at least, that the soil does not dry out.

Plants set in the fall should be pruned back to from 8 to 12 inches. If left longer, the canes are whipped by the wind, and the excess of the top over the root system transpires moisture rapidly, causing the wood to shrivel and die. If the plants are cut back as described and are properly protected, enough wood will remain to produce a good crop of flowers the first year. Spring-set dormant plants should be pruned back as soon as set to from three to five shoots or canes within three or four inches of the soil. The uppermost bud left on each cane should be pointed outward, as these buds grow most vigorously and would soon interlace if pointing inward. Cutting back after planting is absolutely necessary if a strong, vigorous growth is desired the first season; otherwise the plants will often merely remain alive during this period.

SUMMER CARE AND FEEDING

Throughout the growing season until September, the soil should be stirred frequently with hoe and rake to maintain a mulch of finely pulverized soil. The soil should never be allowed to bake. A mulch of peat applied after the first cultivation prevents the formation of a crust over the surface and also helps to conserve moisture. After every hard rain, as soon as the soil has dried sufficiently, the beds should be hoed and raked.

If the soil is prepared properly, the plants will need no fertilizer the first summer. In the fall a heavy mulch of well-rotted horse or cow manure should be applied about the base of each plant. Just before the ground freezes, the mulch should be covered with soil making a mound 10 or 12 inches high about the plant. During the winter the plant-food substances in the manure are washed down to the area of the feeding roots and the food elements become available quickly when active root action begins in early spring. After the first year, if animal manures are not available, the roses should be fed with some chemical fertilizer such as a 5-10-5 analysis. It should be applied broadcast after the surface mulch has been freshly stirred, and should be worked well into the soil about the base of the plant. An application of 3 pounds to each 100 square feet of bed surface may be applied safely as often as once in ten days. An occasional feeding of ammonium sulfate is beneficial, using 1½ pounds to 100 square feet of garden surface. /

The second summer a mulch should be applied about the middle of July to Hybrid Teas and Polyanthas. The climbing or pillar roses should be given a heavy mulching with manure after they are pruned in late July. This encourages a growth of strong canes during early fall. Care should be taken not to mound the manure about the base of the plant. Late feed-

ing is detrimental, for it stimulates a succulent growth late in the fall which results in winter killing.

PRUNING

Some roses form buds at terminals of new growth; others form them only on wood of the previous year's growth. Pruning varies therefore with different types.

Hybrid Teas

Hybrid Teas, Hybrid Perpetuals, and Bengal types are pruned the most severely. The weaker the growth of a variety, the more it should be pruned to throw the vigor back to the base of the plant. Summer cutting of flowers is practically summer pruning. All dead flowers should be removed to promote the development of more branches, each of which is naturally terminated by a flower. When cutting flowers, the stems should be as long as possible, provided two or three buds are left at the base to produce new shoots. Polyanthas should be merely thinned.

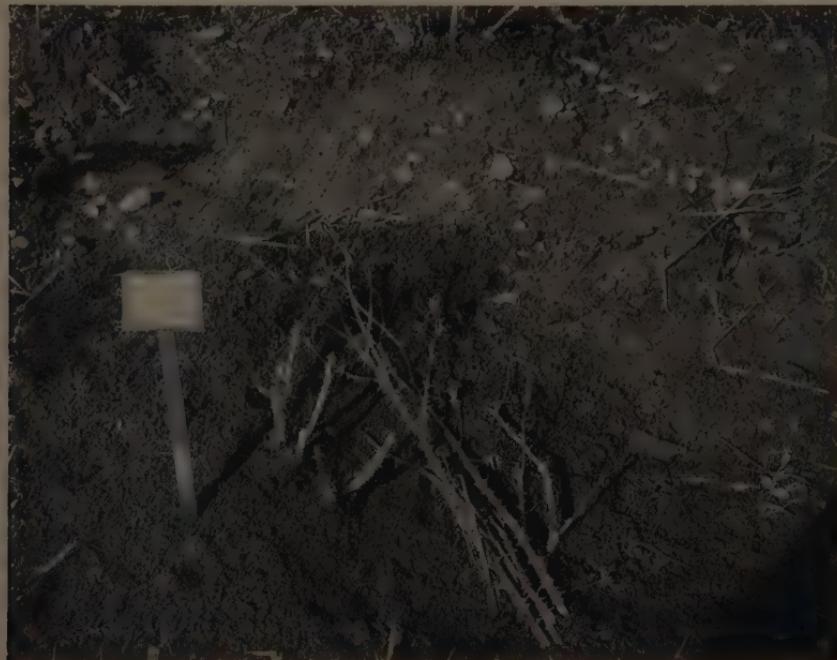


FIGURE 12. HYBRID-TEA ROSE BUSHES IN SPRING

The mounded soil has been removed after frosts and the plants have been pruned. Note the amount of wood removed.

As winter approaches, soil or peat moss is coned about the base of the plants for winter protection. Usually top-growth is killed back to the surface of the soil. In the spring when danger of heavy freezes is past, the soil is removed and the branches are pruned back to within 6 or 8 inches of the original surface of the soil. All weak stems are removed so that usually but five or six strong canes are left. As has been stated, all newly planted roses should be pruned back severely immediately after they are in the ground.

Other Bush Roses

Most other Bush Roses flower on older wood or do not produce long flower stems. Included in this group are the *rugosas*, the Austrian briars, and most of the species used in planting shrub borders. Such types are pruned less severely. The danger is that old bushes will become overgrown and unsightly. In early spring or in midsummer, after the flowering season is over, the growth of the previous spring should be shortened and all weak or unsightly branches removed. Sometimes it is well to cut some of the older bushes to the ground, to encourage new growth from base. This is desirable particularly with the Austrian Briars and the *Rosa Hugonis*.

Climbing Multiflora and Wichuriana Hybrids

Most varieties of climbing roses flower on the wood of the previous season's growth. It is desirable, therefore, to prune climbing and pillar roses in midsummer as soon as the flowering season is over and to encourage a heavy growth of new canes immediately after the flowering season. All flowering canes are cut out at the base. Varieties which naturally produce but little wood after flowering, such as Dr. Wm. Van Fleet, should be pruned less severely. A few strong canes of the previous year's growth which have flowered should be selected and, instead of removing the whole cane, only the laterals that have flowered should be cut off. About two buds should be left on each branch.

WINTER PROTECTION

In New York State the amount of protection required depends upon the locality in which the roses are grown, also upon the varieties selected for planting. One should choose carefully those varieties which experience has proved to be the most hardy. Varieties hardy in southern New York often will not survive the winters in the northern part of the State. The varieties suggested on pages 11 to 15 have proved hardy in the vicinity of Ithaca, where the mercury has gone as low as 20° below zero.

Hybrid Teas, Hybrid Perpetuals, and some Polyanthas need winter protection in the northern part of the State. Fall and winter conditions

influence the amount of winterkilling. When climatic conditions in late fall are favorable for growth, the plant tissues are soft and succulent and much injury results. Lack of moisture in the soil in late winter and early spring also causes injury to the plants.

All tender species should have soil mounded about them to a height of 12 or 15 inches. This keeps the wood and buds at the base of the plant from drying out. It also prevents water from standing about the plants. In drawing up the soil, care must be taken not to injure the root system.

After the ground is frozen, a straw-mulch or some coarse litter, may be thrown over the plants. If this is done before the ground freezes, the litter may harbor mice. They may girdle the stems, causing great injury to the rose plants. For this reason the use of straw or cornstalks is not recommended.

Various methods for giving winter protection to climbing varieties have been tested by the Department of Floriculture at the New York State College of Agriculture. The use of cornstalks and evergreen boughs, while effective, harbor mice and rabbits which do great damage to the canes. Burlap holds too much moisture. If cornstalks or burlap are used, the plants should be thoroughly sprayed, particularly near the base, with arsenate of lead as a protection against mice and rabbit injuries before the covering is put on. The best method to prevent winter-killing is to take the canes down from the trellises or other supports early in October and let the lawn grass grow up among them during the late fall.

Often it is necessary to use some heavy material at the base of the bush to hold the canes down. Two 2x2-inch pieces of wood about $2\frac{1}{2}$ feet long driven into the soil, as shown in figure 14, are excellent for this purpose. Soil is mounded about the base of the plants. Practically no winter-killing has resulted from this method even during the exceptionally cold winters of 1933 and 1934.

Early in the spring, after danger from severe frost is over, the stakes are removed, the mounds of earth are removed from the bases of the plants, and the canes are tied to their supports.



FIGURE 13. HYBRID TEA PROTECTED FOR WINTER

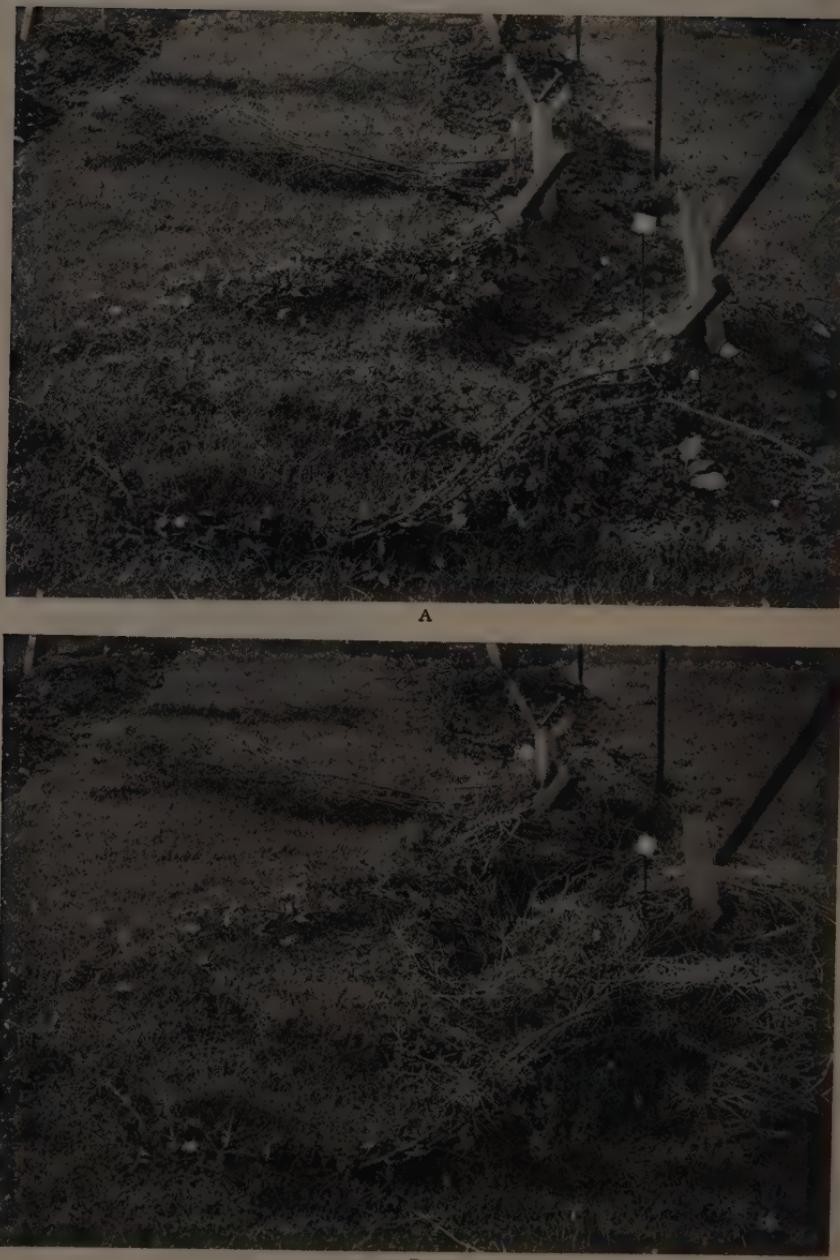


FIGURE 14. CLIMBING ROSE BUSHES PROTECTED FOR WINTER

A. The branches have been removed from the trellises and mounded with soil. The grass which has grown among the branches furnishes additional protection
B. After the ground has frozen, a strawy mulch is placed over the mounded soil

The Hybrid Teas and Hybrid Perpetuals are pruned after the mulch and mounds of earth have been removed, and, under normal conditions, rapid growth quickly follows.

DISEASES

L. M. MASSEY

ROSES grown in gardens in New York and in areas with similar climate are affected by several diseases of sufficient importance to make control measures an essential part of cultural practices. These diseases, in order of usual prevalence and importance, are: blackspot, powdery mildew, brown canker, and common, or stem, canker. Other diseases, such as rust, anthracnose, brand canker, and several leafspots, may become troublesome in certain plantings and may require special attention. The gardener should be able to recognize the more prevalent diseases and should seek assistance from the pathologist in diagnosing troubles that may be due to the less common diseases.

BLACKSPOT

Blackspot occurs wherever roses are grown. Nearly all of the cultivated varieties are affected, although not all varieties suffer equally. The Austrian Briers and Polyanthas growing in the University garden at Ithaca have suffered most, with the Pernetianas scarcely less severely affected. The susceptibility of the Hybrid Teas and Hybrid Perpetuals is well known, the Mosses and *rugosas* may be severely spotted, and in some instances climbers have been observed to be badly spotted and defoliated.

Symptoms

This disease appears as black spots on the leaves, petioles, and stems. The spots on the leaves are circular and characterized by "feathery" margins. They usually appear on the upper surfaces of the leaves late in the spring or early in the summer. A number of the spots may coalesce, and in severe attacks the entire leaf may be covered with large black patches. The leaf tissue adjacent to the black spots may become chlorotic before the leaves fall from the plant, and commonly all of the uninvaded tissue becomes yellow before defoliation occurs. The leaflets may turn yellow in spots, while sometimes the yellow area is limited to a band outside the black spot.



FIGURE 15. ROSE LEAF AFFECTED WITH BLACKSPOT, CAUSED BY THE FUNGUS
DIPLOCARPON ROSAE WOLF

Note the "feathery" margins of the circular black spots

Premature defoliation is one of the most pronounced characteristics of blackspot, affected plants often having a partially defoliated appearance. The size of the spots, and the extent and rapidity of defoliation, vary with the variety. Following early-season defoliation, leaf buds which should remain dormant till the following year may open late in the season. As a result the plant is weakened, the wood is improperly matured, and such plants are subject to winter injury and to losses in storage or in forcing. Defoliated plants produce fewer blossoms the following year. Cane infections may occur on the tender immature wood, especially on soft-wooded varieties such as Los Angeles, Golden Emblem, Wm. F. Dreer, Mme. Edouard Herriot, and others. The spots appear as raised irregular blotches.

Cause

Blackspot is caused by the fungus *Diplocarpon rosae* Wolf.

Life history

The fungus hibernates as mycelium in the old leaves, where it develops its sexual spore-stage during the winter, or it hibernates as mycelium in the lesions on the stems. Initial infection in the spring results either from the sexual spores produced in the old leaves on the ground, which are splashed to the newly developing foliage, or from the asexual spores produced by the mycelium in the cane lesions. Within a week or so a crop of the asexual, or summer, spores is produced in these initial infections, to be splashed by rains to other leaves or plants where they germinate and produce new spots. Infection may result any time throughout the summer when the foliage is wet.

Both temperature and moisture are related to the development of black-spot, although exact relationships are not yet known. In the garden the disease is definitely more severe in wet than in dry seasons.

Control

Eradication

Since the fungus hibernates in the old leaves on the ground, the gardener should rake and burn them in the autumn as soon as defoliation is complete. This reduces the chances for infection in the spring. To be effective, it is essential that the old leaves be destroyed early, before they start to disintegrate. The cutting back of canes in the spring to three or four buds will eliminate most of the cane lesions and thus will aid in the control of the disease out of doors.

Protection by spraying and dusting

Eradication alone is not enough to assure control of blackspot, and the use of some protectant is necessary. Bordeaux mixture 4-4-50 and lime-sulfur solution, 1 part in 50 parts of water, are effective when properly applied, but are objectionable in that they discolor the foliage. Also, these materials may cause severe burning and stunting of the plants. Non-staining substitutes, such as ammoniacal copper carbonate, have not proved to be so effective as have bordeaux mixture and lime-sulfur. Sulfur dust has been found to be effective, and its ease of application, along with the reduced amount of discoloration when properly applied, has resulted in its rather extensive use. The availability of sulfur dusts that have been dyed green, thus to further reduce the amount of discoloration to the foliage, has contributed to the popularity of the dusts. Since the addition of arsenate of lead increases the fungicidal value of the sulfur, and also serves as a poison for chewing insects, a mixture of 90 parts of sulfur and 10 parts of arsenate of lead is given preference over the straight sulfur even though the arsenate of lead probably increases the tendency of the

dust to burn. The efficiency of a dust varies directly with its fineness, and only materials prepared especially for dusting should be used. A sulfur dust coarser than 300 mesh will probably be unsatisfactory.

Recent experiments indicate the effectiveness of sprays which consist of finely ground (300 mesh) sulfur and some material such as calcium caseinate, glue, and others, which cause the sulfur to go into suspension when added to water, hence the name *wettable sulfur sprays*. These sprays are less caustic than lime sulfur and less liable to injure the plants than are copper-containing sprays. If spraying is preferred to dusting, the preference should usually be given to one of the wettable sulfur sprays.

Timeliness

The selection of the proper fungicide is no more important than the correct timing of the applications. Many gardeners have decided that the material used was at fault when the real difficulty lay in the failure to have the foliage covered and thus protected throughout periods favorable for infection. From the time the first leaf buds unfold until frost, the plants should never go through a rain period without a protecting coating of the fungicide on the leaves. During the time when the leaves are making rapid growth, and during rainy weather, it may be necessary to dust or spray the plants two or even three times a week. Later in the season, when the plants are not growing so rapidly and rains are less frequent, treatments at intervals of a week or ten days may be sufficient. Instead of following an arbitrary schedule, one should have in mind the necessity of covering all parts of the plant with a fungicide at the beginning of each rain period. If rains have removed the previous covering from plants in the garden and if new leaves have developed or old ones have increased in size since the last treatment was made, one must spray or dust again. If one is unsuccessful in preventing initial infections, so that the fungus becomes established in the garden, the difficulty of preventing secondary infection is increased.

Thoroughness

All parts of the plants must be covered with the fungicide in order to provide adequate protection.

In dusting, it is not necessary to use so much material as to discolor the foliage greatly; but one must dust from all sides of the plants, and see that all of the foliage, both upper and lower surfaces, is covered. The best time to dust is early in the morning, or in the evening, when the air is quiet. It is neither necessary nor desirable that the leaves be wet when sulfur dusts are used; plenty of the sulfur will adhere to a dry leaf to protect it.

In spraying, one must use a nozzle that will give a fine mist, and there must be plenty of pressure—the more the better. It should be unnecessary to spray until the material drips from the leaves. Sprays should have time to dry on the foliage before the plants enter rain periods. Sprays that do not wet and adhere to the waxy surfaces of rose leaves—and this seems to be a fault with most of them unless especially prepared—will not provide adequate protection, especially to the young, new growth which is particularly hard to wet. Spraying in the middle of the day in hot, muggy weather, may result in injury to the foliage, especially if it is drenched. It may be advisable to reduce the concentration of sprays and to make lighter application of dusts at less frequent intervals during unusually hot weather, in order not to burn the foliage.

Dusters and sprayers

Substantial sprayers that will withstand adequate pressures, and equipped with nozzles designed to convert the spray into a fine mist, are available. The nozzle and rod equipment should be so arranged that the operator can cover the undersides of the leaves without too much labor. The size of sprayer usually purchased is one that holds from $2\frac{1}{2}$ to 3 gallons of liquid. Good dusters of the plunger or bellows type may be had and are satisfactory for small gardens, while the larger machines of the crank type may be purchased by those growing large numbers of plants. Both traction and power sprays and dusters are available for the nursery.

Powdery mildew

Powdery mildew is probably as widely distributed as the rose and is rarely absent from plantings in the garden and the greenhouse. The disease is especially severe on certain varieties of Hybrid Teas, Climbers, and Ramblers, although most varieties are susceptible and in seasons favorable for mildew few of the reputed resistant roses escape.

Symptoms

Powdery mildew starts on the young leaves as raised, blister-like areas which soon become covered with a grayish white, powdery fungus growth. Older leaves may be attacked, usually with little distortion. Young growing tips may be completely covered with the mildew, with resulting dwarfing and curling of the leaves, stems, and buds. Not infrequently the unopened buds are white with mildew before the leaves are affected to any great extent. Affected buds may not open properly, and in severe cases premature defoliation may result.



FIGURE 16. POWDERY MILDEW (*Sphaerotheca pannosa* (WALLR.) LEV.
ROSÆ WOR.) ON LEAF OF RUGOSA ROSE

Minute black fruit bodies (perithecia) are buried in the white, felty patches on the leaves

Cause

Powdery mildew is usually ascribed to the fungus *Sphaerotheca pannosa* (Wallr.) Lev. rosae Wor., although by some it is thought that a strain of *Sphaerotheca humuli* (D. C.) Burr., the fungus causing mildew of the hop, is in part the cause of the mildew of roses in America.

Life history

As to the manner of hibernation of the fungus, three ways have been suggested; namely, sexual fruit bodies, perennial mycelium, especially in association with the buds, and in the vegetative, or asexual spore stage. Climate probably determines how the fungus overwinters. The sexual (winter) spores or the asexual (summer) spores, depending on the manner of hibernation, initiate primary infection in the spring out of doors. The conspicuous white, powdery growth covering the diseased areas is composed largely of colorless spores produced in large numbers. These spores are carried to other parts of the plant and to other plants, largely by the wind, where they germinate and cause secondary infection. The winter spore stage is developed in the felty mycelial patches on stems or leaves and may serve to carry the fungus over the winter in climates where the summer spores are killed by the low temperatures. Under glass the fungus may continue throughout the year in the vegetative stage. Mildew on roses out of doors is usually most severe in late summer.

Control

Repeated applications of a fungicide are necessary to control mildew; and while it is possible to effect control in some cases, at least, by beginning these applications after the disease appears, better results will be had by starting early and protecting the plants throughout the season. Evidence favors the use of sulfur-containing fungicides, and good results have been obtained with both dust and spray in the control of mildew. Weekly applications of a mixture of 90 parts of finely divided (dusting) sulfur and 10 parts of arsenate of lead will usually suffice. This dust should be applied as soon as growth starts in the spring. Only sulfur that has been specially prepared for use as a dust should be applied, and it should be of 300-mesh fineness. Lime sulfur, 1 part in 50 parts of water, potassium sulfide solution, 1 ounce in 3 gallons of water, and the wettable sulfurs (page 36) are effective if one prefers spraying to dusting.

As a general practice in the control of rose diseases, including powdery mildew, it is suggested that the dormant plants be given two sprays with lime-sulfur solution, diluted 1 part in 9 parts of water. The first of these sprays should be made to the defoliated plants late in the autumn after the wood has matured and, in the event that the plants are given winter protection, just prior to piling up the soil and covering the plants. The second dormant spray should be made with the advent of warm weather in the spring but before the first leaf buds start to open.

BROWN CANKER

While not so prevalent as blackspot and mildew, brown canker is known to occur in eastern, central, southeastern, and southwestern United States and is probably of wider distribution than records indicate. It is known to have been present in this country since about 1902, and in more recent years to have occurred in epiphytic severity in many plantings. When present and conditions are favorable for its development, brown canker may be very destructive. Plants may be killed or greatly disfigured. The Teas, Hybrid Teas, and Hybrid Perpetuals, in the order named, are particularly susceptible, while the Briers, Rugosas, Mosses, most of the species, and some of the ramblers appear to be less frequently affected.

Symptoms

The lesions produced by this disease may occur on any part of the plant aboveground. On the stems the active cankers are characterized by their cinnamon-buff color and by a purple border. Initially these cankers are relatively inconspicuous, circular, purple spots which later develop into whitish, necrotic areas. Some of these minute, young lesions may be "healed out" during the summer and thus rendered inactive; others, under favorable conditions, develop into cankers which may extend several inches in length and may girdle the stem, resulting in the death of the distal part. Much of the development of the stem lesions from the initial white areas to the purple-bordered, cinnamon-buff canker, takes place during the winter and spring.

On the foliage, which is but occasionally attacked, the disease is evident at first as small purple spots or flecks which later become characteristically cinnamon-buff in color, with a purple border. On the blossoms, the outer exposed petals are commonly disfigured by the large nearly circular brown areas. Infected buds may fail to open. The blossom canes may become infected from diseased buds and may gradually die back.

Brown to black, pimple-like elevations which add to the diversity of the color of the lesions on stems, foliage, and petals and which are the fruit-bodies of the fungus, constitute an important sign of the disease and may be used in its diagnosis.

Cause /

Brown canker is caused by the fungus *Cryptosporangium umbrina* Jenkins.

Life history

The brown-canker fungus overwinters in the cankers on the stems. In the initial-infection lesions (small whitish areas) on the current year's canes, the fungus remains quiescent until the late winter or spring when



FIGURE 17. CANKERS ON CANES, CAUSED BY THE FUNGUS *CRYPTOSPORELLA UMBRINA* JENKINS

Cane on right shows the initial infections of the current year; cane on left shows an older and larger canker. (Photograph from Dr. A. E. Jenkins of the United States Department of Agriculture)

it resumes activity and the canker enlarges. Under favorable conditions (abundance of moisture) spores are produced in great abundance in a few days' time to be splashed about to other parts and plants where new infections result. Throughout the season masses of these spores ooze forth from lesions during rain periods and serve to disseminate the fungus. Infection may occur through wounds or directly through the uninjured, tender new growth where the fungus produces the inconspicuous white spots on the canes.



FIGURE 18. USING A DUSTER OF THE BELLOWS TYPE
Note the cloud of dust enveloping the plant

Control

Care should be exercised to see that no plants bearing brown-canker lesions are introduced in gardens free from the disease. Since the disease is found in many nurseries, any purchased plant should be looked upon as a possible source of infection and should be planted only after careful inspection.

Heavy pruning in the spring, to remove the canes that may carry the inconspicuous small whitish lesions, as well as the removal of all cankers, is important. This is especially true if the disease is known to be present in the garden. As infected stems appear during the season they should be immediately pruned out and burned, cutting several inches below the lower limit of the lesion. Old, neglected rose plants growing near the garden have been found to provide the inocula for near-by plants and to make control of brown canker unusually difficult. These should not be overlooked in any efforts taken to eradicate the fungus.

Exclusionary and eradicator measures should be supplemented by spraying or dusting. The gardener will be spraying or dusting for the control of blackspot and mildew, and this practice will be adequate to reduce brown-canker infections, especially if sulfur-containing fungicides are used. In addition to the summer applications it is suggested that the plants be given a dormant spray of lime sulfur (1 part of concentrated lime sulfur to 9 parts of water) in the fall before the winter protection is applied, and again in the spring before the buds open. Spraying or dusting alone will not control the disease but should be combined with eradication based on rigid inspection and severe pruning when needed.

COMMON, OR STEM, CANKER

While seldom of epiphytic severity, common, or stem, canker is found in most plantings and is frequently the cause of dead canes and plants in gardens. The disease may become severe in plantings that do not receive proper care, especially where the stems have been unnecessarily wounded and the dead wood has not been removed and burned. Common canker is widespread throughout the United States. It is more prevalent on Hybrid Tea roses than on other kinds, but nearly all varieties of out door roses suffer from the trouble.

Symptoms

Any portion of the stem may be affected, as the fungus usually enters through wounds. The lesions start as pale-yellow or reddish spots in the bark which gradually darken to brown or black as the infected areas enlarge. As the diseased tissue dries the bark cracks and the canker becomes sunken. Small black pin-point structures, the fruit bodies of the fungus, are abundant on the affected bark and aid in diagnosing the disease. The stem may be girdled by the canker, with the result that the distal portion dies.

Cause

Common, or stem, canker is caused by the fungus *Coniothyrium fuckelii* Sacc.

Life history

The fungus overwinters in the lesions on the canes. An abundance of spores produced in the fruit bodies in the lesions ooze out during rainy weather and are splashed to near-by parts and plants. Entrance is through wounds in the bark.

Control

The pruning of all affected parts and their immediate destruction by burning is the most important control measure. Sprays and dusts have not been found to be effective. It is important that no wounds are made in the bark, since the fungus gains entrance through wounds, and where the disease is prevalent it may be advisable to protect cut surfaces made in pruning with a coating of paint or shellac. All dead wood, from any cause, may be suspected of harboring the fungus, and it is well to keep this pruned out and to so handle the plants as to avoid having dead plant parts in the garden.

OTHER DISEASES

Several fungous leafspots are to be found on roses and may cause objectionable disfigurement, as well as severe defoliation, when conditions are favorable for their development. Rust is prevalent and causes serious injury in certain areas, notably along the Pacific Coast, and at times is to be found causing damage in gardens in the East. These diseases are generally held in check by the spray or dust program found necessary in practically every garden for blackspot and mildew control. Diagnosis of any disease and detailed directions for its control may be had by addressing an inquiry to the Department of Plant Pathology at the New York State College of Agriculture, at Ithaca, New York.

INSECTS

APHIDS, OR PLANT LICE

W. E. BLAUVELT

Aphids, small, soft-bodied insects, are one of the most common and troublesome pests of roses. They reproduce rapidly and often literally cover the tender shoots and blossom buds. They feed by puncturing the tissue with their bristle-like mouthparts and sucking out the plant juices. Badly infested shoots, become stunted and crooked, the leaves become curled, and the flower buds may drop or fail to open normally. The leaves are often coated with a sticky material, known as *honeydew*, which is secreted by the aphids.

A number of different species of aphids attack roses, but the most common are the rose aphid² and the potato aphid³. The individuals of both species vary in color from green to pink or even a dark red. Both species pass the winter as shiny, black eggs on the bark of the rose canes.

² *Macrosiphum rosae* Linnaeus

³ *Illinoia solanifolia* Ashmead

The rose aphid breeds on roses throughout the season. Most of the lice are wingless but occasionally winged forms are produced. The potato aphid infests roses only during the spring. Many of the individuals of the second brood and all of the third brood develop wings and fly to other plants, particularly potatoes, where they breed during the remainder of the season.

Control

Aphids are readily controlled by nicotine sprays or dusts. For spraying, nicotine sulfate is used at a dilution of 2 teaspoonfuls to a gallon of water to which about 2 tablespoonfuls of a good grade of neutral soap flakes, soap powder, or liquid soap has been added. The soap is essential to enable the spray to wet and cover the leaf surface and the waxy bodies of the aphids and to release nicotine vapor.



FIGURE 19. ROSE BUDS INFESTED WITH APHIDS

Many brands of spray materials containing pyrethrum or rotenone or combinations of the two are available. These usually control plant lice satisfactorily, although they are not so reliable as nicotine. Since the different brands vary in strength, they should be diluted according to the manufacturer's directions. Practically all brands contain a wetting agent so that the addition of soap is unnecessary unless stated.

For the control of aphids by dusting, a nicotine-lime dust containing 3 or 4 per cent of nicotine is advised. This dust gives excellent control of aphids and is available ready mixed from insecticide companies. For best results the dust should be applied on a warm, still day.

ROSE SLUGS

The foliage of roses is frequently injured by small caterpillar-like insects known as *rose slugs*. They are the young of shinning-black, four-winged insects called *sawflies*. The three common species of rose slugs are the bristly rose slug,⁴ the curled rose sawfly,⁵ and the rose sawfly.⁶ The bristly rose slugs when young skeletonize the leaves from the under surface, leaving only the veins and the thin, transparent upper layer intact. When older they eat holes entirely through the leaves. Leaves skeletonized by this slug have a characteristic glazed appearance. There are three or four generations a year. The curled rose sawfly eats the entire leaf tissue, feeding along the edge with the body curled underneath. There are two broods a year. The rose sawfly skeletonizes the leaves from the upper surface, producing a characteristic pale greenish to yellowish chafed appearance. This species has only one brood a year.

Control

Rose slugs are readily controlled by an arsenical spray or dust. For spraying, powdered lead arsenate is used at the dilution of 2 level tablespoonfuls to a gallon of water. The addition of 2 level teaspoonfuls of casein spreader, or a cupful of skimmilk will help the spray to wet the waxy leaf surface and will result in more even distribution of the spray material. For those who object to the white color of lead arsenate on the foliage, green-dyed lead arsenate is available. If bordeaux or wettable sulfur sprays are being used for disease control, the lead arsenate may be added to these sprays.

For the control of rose slugs by dusting, a mixture of 85 or 90 parts of sulfur and 15 or 10 parts of lead arsenate is used. These dusts are available ready mixed and are excellent as a combination treatment for

⁴ *Cladius isomerus* Norton

⁵ *Emphytus cinctipes* Norton

⁶ *Caliroa aethiops* Fabricius

the control of rose slugs and rose diseases (see under rose mildew, page 39). If properly applied, the dust covers the foliage more evenly and causes much less discoloration than does the spray. Green-dyed sulfur-lead arsenate dusts are available.

ROSE LEAFHOPPER

(*Typhlocyba rosae* Linnaeus)

The foliage of roses frequently develops a mottled grayish-green appearance on the upper surface as a result of injury by the rose leafhopper. In severe cases the injured leaves later turn brown and fall prematurely. The leafhoppers are small, yellowish white insects found on the lower surface of the leaves. They feed by puncturing the leaf tissue and sucking out the plant juices, including the green coloring matter. The adult leafhoppers have wings and fly about when disturbed, while the young are wingless and move quickly with a peculiar sidling motion. The insect passes the winter as eggs inserted in the bark of the canes. The eggs hatch about the middle of May, and there are two broods a year.

Control

The rose leafhopper is best controlled by a nicotine spray or dust, as recommended for the control of plant lice (page 45). Best results are obtained if the dust or spray is applied when the leafhoppers are in the young, wingless stages. An application about the middle to the latter part of May will control the first brood before they have caused much injury and, at the same time, will be effective against the early broods of plant lice.

THrips

Roses are frequently injured by tiny slender insects known as *thrips*. The thrips worm their way into the unopened blossom buds and feed on the tender petals, rasping the tissues with their mouthparts and sucking up the liquid cell contents. Injured buds turn brown and either fail to open or produce misshapen blossoms with brownish injured areas on the petals. Injured blossoms rapidly drop their petals. Injury by thrips to the foliage shows typically as speckled silvery spots.

Several species of thrips attack roses, but the onion thrip⁷ appears to be the most common offender in New York. The adult thrips are about one-twentieth of an inch in length, brownish, slender, and active. The immature thrips are pale yellow. The onion thrip feeds and breeds on a large number of cultivated plants and weeds. The thrips winter over as adults, and there are a number of generations a season.

⁷ *Thrips tabaci* Linnaeus

Control

Nicotine sulfate, diluted at the rate of 2 tablespoonfuls to 3 gallons of water in which about 6 tablespoonfuls of a good neutral grade of soap flakes, powdered soap, or liquid soap has been dissolved, makes an effective contact spray against thrips. The pyrethrum and rotenone sprays have usually not proved so effective as nicotine. If dusting is preferred, a nicotine-lime dust containing 4 per cent of nicotine may be used. Dust containing smaller percentages of nicotine are not sufficiently effective. Nicotine dust should be applied at a time when it is warm and quiet.

Where thrips are troublesome, spraying or dusting should be started early in the season and repeated at weekly or ten-day intervals until the roses are in bloom. If treatment is delayed until the blossom buds are formed, the results will be unsatisfactory since most of the thrips will be inside the buds where they cannot be reached by spray.

ROSE CHAFER, OR ROSE BEETLE

(*Macrodactylus subspinosus* Fabricius)

The rose chafer, often called the rose "bug," is an ungainly long-legged, grayish brown beetle about one-third inch in length. The beetles appear in gardens, often in swarms, about the middle of June and are present in destructive numbers for about four weeks. They riddle the blossoms and blossom buds and feed to a lesser extent on the foliage. The beetles attack chiefly white and light-colored varieties.

The rose chafer is a serious pest only in localities where the soil is light or sandy. The young are small yellowish white grubs with brown heads. They live in the soil and feed on the roots of grasses. They do not thrive in heavy soil or in soil that is cultivated or planted to legumes.

Control

The rose chafer is a very difficult pest to control because it attacks the blossoms and because the beetles continue to fly into the garden in numbers and quickly replace those that are killed. A spray of powdered lead arsenate, 4 level tablespoonfuls to each gallon of water, applied when the beetles first appear and repeated at ten-day to two-week intervals will afford considerable protection to the foliage and is particularly useful with late roses not in bloom when the beetles are abroad. The most practical method of protecting the blossoms of early-blooming roses is to go through the garden every day or so and pick or jar the beetles from the plants into a bucket partly filled with kerosene or with water having a layer of kerosene on top. This is best done in the cool of the morning when the beetles are sluggish. Spraying with one of the numerous brands of



FIGURE 20. ROSE CHAFER

pyrethrum-rotenone plant sprays at dilutions recommended by the manufacturers for resistant insects may be substituted for hand picking, although this method is expensive and less certain. Since this material kills only the beetles actually wet with spray and does not protect the blossoms from other beetles flying in, the treatment must be repeated at frequent intervals just as with hand picking. A reliable method of protecting choice plants is to cover them with coarse mosquito netting or cheesecloth.

RED SPIDER MITE

(*Tetranychus telarius* Linnaeus)

Injury to rose foliage by the red-spider mite shows as a dingy grayish-green mottled or peppered appearance of the upper surface. Badly infected leaves turn brown and drop prematurely. Fortunately, serious injury from the red spider mite is much less common out of doors than in the greenhouse.

The mites live on the undersurface of the leaves and feed by puncturing the leaf tissue and sucking out the plant juices, including the green

chlorophyll. They are barely large enough to be seen with the naked eye and range in color from yellowish or greenish with black spots to orange. When abundant, the mites may cover the leaves with fine silk webbing. The mites develop rapidly, and there are many generations during a season. They are most injurious during hot, dry seasons.

Control

Nicotine sprays or dusts, as used for the control of plant lice, are not sufficiently effective against the red spider mite. Finely ground sulfur dusts or wettable sulfur sprays, as used for the control of rose mildew, (page 39), will usually keep the mite in check. If the mites become abundant, probably the most satisfactory treatment is to spray with one of the standard brands of rotenone insecticides at the dilution indicated by the manufacturer. To be effective, the spray must be applied so as to thoroughly cover the underside of the leaves. This necessitates the use of an angle-nozzle on the spray rod. Since many of the eggs may survive the treatment, a second application three or four days after the first is advisable to kill the young mites as they hatch.

ROSE CURCULIO

(*Rhynchites bicolor* Fabricius)



FIGURE 21. ROSE CURCULIO AND INJURY

The rose curculio is a conspicuous little beetle about one-quarter of an inch long, black below and bright red above, with its mouth-parts at the end of a long black snout. With its long snout, the beetle gnaws deep holes in the flower buds. Some of the injured buds fail to open and those that do open are riddled with holes. The beetles are most abundant during June and early July. The young or grubs develop in the hips (fruits) of roses, principally *Rosa rugosa*, and overwinter in the soil.

Control

The most practical method of control where this insect is a problem is to go over the plants every day or so while the beetles are abundant and to pick or jar them from the plants into a pan containing a small amount of kerosene. Spraying the plants with 4 level tablespoonfuls of powdered lead arsenate and either 2 teaspoonfuls of casein spreader or 2 tablespoons of flour to 1 gallon of water will repel or poison many of the beetles. The lead arsenate and the casein or flour should be stirred to a paste with a small quantity of water before they are added to the water. Frequent applications of sulfur-lead-arsenate dust, as recommended for the control of rose mildew and rose slugs (page 46), undoubtedly affords some protection from the beetles.

Collecting and burning all rose hips, especially those of rugosa roses, during August will destroy many grubs and reduce the numbers of the beetles the following year.

ROSE MIDGE

(*Dasyneura rhodophaga* Coquillett)

The rose midge, although primarily a pest of greenhouse roses, has in recent years caused considerable injury to garden roses in several localities in New York.

The injury from rose midge is readily distinguished from that of any other rose insect. The injury is caused by the small, white to orange colored, legless maggots. The most common point of attack is on the leaf buds and young shoots in the axils of the leaf petioles. Injured shoots grow crooked and may die and drop off when only a few inches long or even before the leaves unfold from the bud. Flower buds are often infested and are either killed or so deformed as to be unsalable.

The adult is a yellowish-brown midge or mosquito-like fly about 1/20 inch in length. The females live for about two days, laying their eggs in the tender young shoots. The eggs hatch in two or three days and the maggots become full-grown in about a week. The full-grown maggots work their way out of the buds, and drop to the ground where they construct silken cocoons in the soil. In the cocoons the maggots change to adult midges within about a week. Thus a brood may develop in as short a time as two weeks under favorable conditions, and the pest increases in abundance very rapidly.

Rose midge is most abundant and destructive from May to July and again in September and October. During the winter months the insect remains dormant in the cocoons in the soil.

Control

The rose midge is a difficult pest to control. Probably the best treatment is to completely cover the surface of the soil of the rose bed with finely ground tobacco powder containing 1 per cent of nicotine. Tobacco powder containing a smaller percentage of nicotine is of doubtful efficiency, and shredded tobacco stems are of little or no value. All leaves and trash should be removed from the ground, and the surface should be smoothed off. Then a layer of tobacco powder, $\frac{1}{4}$ to $\frac{1}{2}$ inch deep, is spread over the entire surface; all parts of the bed must be covered. The tobacco kills the maggots dropping from the plants and seeking to enter the soil, and the nicotine leaching out kills some of the pupae already in their cocoons in the soil. The tobacco treatment should be supplemented by the removal and burning of all infested buds and shoots.

ROSE SCALE

Aulacaspis rosae Bouché

Rose scale, a flat, round, snow-white scale, frequently infests garden roses and sometimes becomes so thickly incrusted on the stems as to give them a distinctly white appearance. The soft-bodied scale insects beneath the waxy scale covering feed by sucking out the plant juices. Badly infested shoots are seriously weakened and sometimes killed. There are probably three broods a year.

Control

The rose scale can be controlled by thoroughly spraying the rose plants in the early spring, before the buds open, with a miscible oil spray. Many brands of miscible oils are available. Most of them are recommended to be used at a dilution of 1 to 25. This is at the rate of 5 fluid ounces (10 tablespoonfuls) in 1 gallon of water, or 1 pint (two measuring cupfuls) in 3 gallons of water. The miscible oil should first be thoroughly mixed with a small amount of the water and the remainder of the water then added. It should be stirred or agitated until it forms a milky white emulsion with no free oil floating on top.

It is usually best to cut out and burn old, badly infested stems.

IMPORTED ROSE STEM GIRDLER

(*Agrilus communis rubicola* abeille)

The imported rose stem girdler attacks chiefly rugosa and hugonis roses. The beetles appear in June and July and lay their eggs singly on the stems. The grubs girdle the stem by boring a close spiral tunnel in

the sapwood for a distance of one to several inches up the stem. A gall-like swelling develops over the injured area. The foliage above the girdle often turns yellow, wilts, and dies or the stem breaks off at the girdle. The grubs over-winter in cells in the pith and emerge as beetles the following spring.

Control

Infested canes should be cut off and burned before the beetles emerge the following spring.

RASPBERRY CANE BORER

(*Oberea bimaculata* Oliver)

The raspberry cane borer sometimes attacks roses and occasionally causes considerable damage. The adult beetles appear in June and the females girdle the shoots about 6 inches below the tip by making two rows of punctures around the stem. Eggs are laid singly near the lower row and hatch into grubs which bore slowly down the canes taking two seasons to complete their development.

Control

The wilted tips should be cut off below the lower girdle and then destroyed. If the pruning is delayed, the cut should be made farther down the cane so as to remove the borer. Since the beetle breeds in wild raspberry plants, these should not be permitted to grow near rose gardens.

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